

Physics-Based Aeroanalysis Methods for Open Rotor Conceptual Design, Phase II

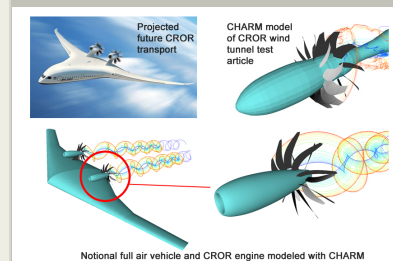
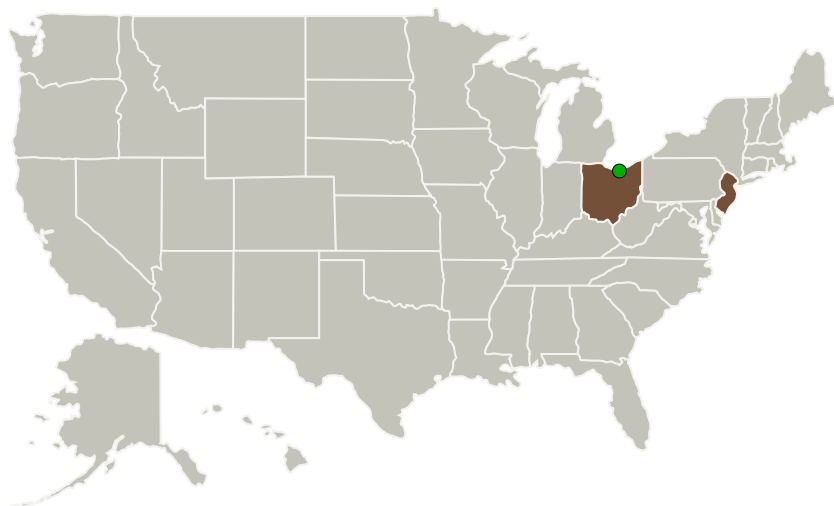
Completed Technology Project (2016 - 2018)



Project Introduction

Operating costs and fossil fuel consumption of civil transports can be reduced through use of efficient counter rotating open rotor (CROR) propulsion systems, thereby addressing both key industry needs and long-term NASA technical goals. To develop such next-generation systems, multiple design variables must be assessed efficiently within a conceptual design software environment. A blend of physics-based, mid-fidelity tools featuring low CPU and ease of setup can provide this capability. Phase I built on an established, highly efficient lifting surface free wake model, the CDI CHARM analysis, and also began initial development of a novel variant of the CDI Cartesian Grid Euler (CGE) model to yield fast-turnaround, low- mid fidelity tools well suited to this requirement. Phase I involved several key upgrades to CHARM and preliminary validation on representative CROR designs. Regarding CGE, formulation of the new rotating frame and multirotor capability has been largely completed, and demonstrations of single rotor modeling are complete. Phase II will entail: additional upgrades to the CHARM rotor blade and airfoil models for improved fidelity; completion of implementation of the CGE analysis for CROR cases; integration of the two models into a unified CHARM-CGE AeroAnalysis (C2A2) architecture; and extensive validation and operational testing.

Primary U.S. Work Locations and Key Partners



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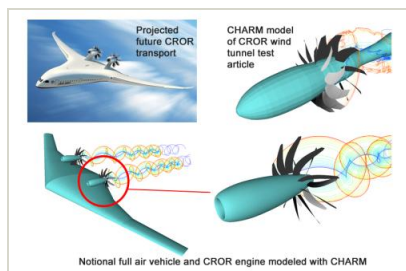


Organizations Performing Work	Role	Type	Location
Continuum Dynamics, Inc.	Lead Organization	Industry	Ewing, New Jersey
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

New Jersey	Ohio
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Images



Briefing Chart Image

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 (<https://techport.nasa.gov/image/132729>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Continuum Dynamics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Todd R Quackenbush

Co-Investigator:

Todd Quackenbush

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Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - └ TX11.5 Mission Architecture, Systems Analysis and Concept Development
 - └ TX11.5.3 Tools and Methodologies for Vehicle or Concept Definition Activities

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System